GESELLSCHAFT FÜR KERNFORSCHUNG MBH, KARLSRUHE

PROJEKT PROZESSLENKUNG MIT DV-ANLAGEN

KFK - PDV REPORTS

P U B L I C A T I O N S   L I S T,

ABTRACTS.

COPY AVAILABLE TO DDC DOES NOT PERMIT FULLY LEGIBLE PRODUCTION

AUG 1977

DDC
RECEIVED
DEC 19 1977
D

410497

F O R E W O R D

This bibliography cites research publications, with abstracts in English,

In this document you will find a list of abstracts of research publications issued up to August 1977 from the project "Prozeßlenkung mit Datenverarbeitungsanlagen - PDV" (process control with computers). *All reports cited, except three,*
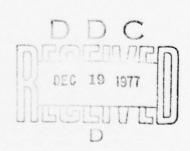
Except Nr. 1, 120, 130, all reports are written in German. You can order them by payment of cost price from

Gesellschaft für Kernforschung mbH., *Karlsruhe (WG)*
- Projekt PDV -
Postfach 3640

D 7500 Karlsruhe
Germany

For your convenience a reply card is enclosed.

K.H. Timmesfeld, B. Schürlein, P. Rieder, K. Pfeiffer, G. Müller,
K. Kreuter, P. Holleczek, V. Haase, L. Frevert, P. Elzer, S. Eichen-
topf, B. Eichenauer, J. Brandes:
PEARL - A proposal for a process- and experiment automation realtime
language.

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 1, April 1973
198 pages, 24 figs., 29 refs.

A middle-level programming-language is described which allows to
formulate the structure, the algorithms, time behaviour and I/O of
realtime programs. It was developed by a group of German industrial
firms and research institutes and is intended for the process control
engineer or experimenter with some programming experience. The report
describes mainly the semantics of the language, but contains also app-
lication examples and an alphabetic list of the syntax formulas.

(out of print)   (DM 22,--)

KFK-PDV 1

R. Stimmelmayr: Evaluation of Literature Concerning Diagnosis of
Computersystems
Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 2, May 1973
1o pages, 51 refs.

The basic reports or studies of previous activities and results
achieved regarding the subject of computer diagnosis were selected
from a variety of papers and are collected in the appendix. The
common structure of the various methods and the possible modific-
ations are demonstrated in a concised form.   (DM 5,--)

KFK-PDV 2

R. Werthmann decision table preprocessor for control systems
(systems design)

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 3, May 1973
75 pages, 11 figs., 16 tabs., 2o refs.

The study deals with the design of a decision table preprocessor for
process control systems. The range of possible applications for decision
tables will be shown, and in particular, the conversion technique itself.
Definite advantages are to be realized in the standardization and simpli-
fication of systems analysis, programming and documentation.
The conversion approach incorporates the matrix method and produces
programs in the PEARL programming language. In accordance with the
table criteria, a selection is made between the most applicable of
two expression methodes - bitstring or comparison operator.
Through control parameters the decision table can be explicitly retained
in matrix form (allowing table changes on-line).
After thorough syntax and semantic description of the preprocessor input,
the procedure will be illustrated with two objective applications.

                                                   (DM 10,--)

KFK-PDV 3

J. Nehmer Hardware Extended Executive Primitives for Process Control
Systems

Gesellschaft für Kernforschung mbH., Karlsruhe
Report KFK-PDV 4, Mai 1973
11 pages, 3 figs.

This report describes on the basis of a layer structure for process
control software the subdivision of the operating system nucleus into
classes of executive primitives which may be called by interruptroutines.

                                                   (DM 5,--)

KFK-PDV 4

H. Herbstreith, P. Kossmann:

Performance characteristics of today's process
control computers

KFK-PDV 5

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 5, June 1973
25 pages, 8 figs., 3 refs.

This report reviews the state of the art in modern process
computers. For this purpose a representative selection of
19 American and European process computers was examined.
The most important characteristics of the central processor
units have been determined and a comparative overview is
given including a discussion of performance data and their
statistical distribution.

By an additional investigation of 256 process computers
operating during the past 7 years trends in the development
of hardware features such as word length, cycle time, in-
struction set and adressing modes are shown.

(DM 10,--)

R. Werthmann, F. Kazis:
Interactive dialog system

KFK-PDV 6

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 6, July 1973
102 pages, 16 refs.

The essay deals with a Dialog System (IDIAL, Interactive Dialog System)
to interface Process Data Processing with its Environment. The initial
description covers several tasks and the main demands which such a
Dialog System must fulfill. The various interface points are then present-
ed and described. The interface point between Man und Dialog System
will be especially in-depth. Relatedly, the proposed Dialog Language for
the Dialog System IDIAL will be explained. In closing, several evaluations
for the implementation of the system are to be presented.

(DM 10,--)

F. Quante:

KFK-PDV 7

Possibilities and limitations of automatic speech recognition for command
input in control rooms.

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Report KFK-PDV 7, July 1973
54 pages, 13 figs., 95 refs.

An analysis of the state of the art of automatic speech recognition
shows, that the recognition of about 10 commands in control rooms
is feasible at an error-rate of 10^{-3} and a reject rate of 10^{-1}.
45 recognition systems are briefly described. Improvements are not
to be expected in the near future.

To fulfill its task, the speech recognition system must be speaker-
adaptive, and the signal tracing has to be done in the presence of
acoustic noise with a noise-cancelling microphone. As a starting-point
for the application in control rooms a procedure with third octave
filtering, time and amplitude normalization is described.

(DM 10,--)

H. Siebert:
Automatic Failure Diagnosis in Technical Processes

KFK-PDV 8

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 8, August 1973
2o pages, 68 refs.

This summary of literature is intended to be a base for further investigations
in the field of failure diagnosis (detection and localization of faults) in
technical processes, considering the use of process computers. We tried to ob-
tain a general view of methods for process supervision, i.e. the detection of
faults and the resulting steps to avoid damages. We used all bibliographical
data we got notice of. This summary presents the state of July 1973; provably it
is not complete.

(DM 5,--)

M. Rupp:
Hardware extended executive primitives for process control
systems (2. intermediate report): executive primitives for
working space management

KFK-PDV 9

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 9, July 1973
23 pages, 3 refs.

Three alternative realizations of executive primitives for
the nucleus internal working space management are reviewed
and discussed.

(DM 5,--)

P. Namneck, I. Schnarre, K. Wagner:
MULI - Multi Level Dialog System,
Multi Level Dialog Language - description of language and system

KFK-PDV 10

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK PDV 1o, October 1973
147 pag., 2 fig.

Volume 1 (KFK-PDV 1o) describes a machine and problem indepen-
dent "Multi Level Dialog Language" and its implementation, the
"Multi Level Dialog System". The system offers a choice of
different language-levels, so that users with varying system
knowledge have access to the same computer functions. The
defined language may be modified and extended at any time,
even during operation, for which no additional programming
is required. The user has complete freedom in defining the
computer action associated with a given input (i.e. with the
semantics of this input). Furthermore the volume discusses
the adaptation to a system (installation) and the adaptation to
a selected problem (application) as well as possible subsets
of the MULI-language and the MULI-system. This includes the
definition of those parameters which are required to tailor a
system to the special needs of a user.

Volume 2 (KFK-PDV 11) contains six case studies. For each of
these studies a computer system is selected and the required
specifications are given.

(DM 12,--)

P. Namneck, I. Schnarre, K. Wagner:
MULI - Multi Level Dialog System,
Multi Level Dialog Language - case studies for application

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report, KFK-PDV 11, October 1973
263 pages

Volume 1 (KFK-PDV 1o) describes a machine and problem independent "Multi Level
Dialog Language" and its implementation, the "Multi Level Dialog System". The
system offers a choice of different language-levels, so that users with varying
system knowledge have access to the same computer functions. The defined language
may be modified and extended at any time, even during operation, for which no
additional programming is required. The user has complete freedom in defining the
computer action associated with a given input (i.e. with the semantics of this
input). Furthermore the volume discusses the adaptation to a system (installation)
and the adaptation to a selected problem (application) as well as possible
subsets of the MULI-language and the MULI-system. This includes the definition of
those parameters which are required to tailor a system to the special needs of a
user.

Volume 2 (KFK-PDV 11) contains six studies. For each of these studies a computer
system is selected and the required specifications are given.
(DM 15,--)

E. Kazis:
Interactive Dialog System Part II

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 12, October 1973
45 pages, 1o diagrams, 6 figs., 8 refs.

The study deals with the implementation possibilities of the interactive dialog
system IDIAL. This is handled in three steps.
Step 1:
Off-line definition phase:
Generates a dialog system that handles special case applications
Step 2:
Syntax testing:
To insure that the syntax of the given instructions matches that of the
dialog system
Step 3:
Module construction:
Contents and task of each module is written.
The new problem oriented language PEARL will be used to program these three
steps.
(DM 5,--)

W. Kutzsche, U. Voges:
GAUSS - a System for Structured Programming

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 13, October 1973
1o5 pages, 18 figs., 23 refs.

The design language GAUSS is used for the analysis of complex problems, for
the generation of portable and adaptable programs and for their complete
documentation. A problem is analyzed, solved, and documented graphically by
stepwise refinement. The first step is done by modelling the problem into a
graph, in which actions and data are explicitly represented as nodes. Each
element, action or datum, is then refined into a structured net of actions and
data again. Thus step by step a hierarchical solution of the problem is deve-
loped in the form of a set of graphical modules. The GAUSS macro processor gene-
rates the program out of these modules. Both, the design language and the
macro processor GAUSS, form the central constituents of a language-independet
programming system.
(DM 10,--)

H. Unbehauen, B. Bauer, B. Göhring, Chr. Schmid: KFK-PDV 14

"On line"-Identification Methods
Evaluation of Literature and Review of the Methods

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 14, August 1973
79 pages, 18 figs., 4 tab., 142 refs.

The basic reports regarding the on-line parameter estimation methods
have been selected from a variety of papers, and collected in this report.
In consideration of common structures, the different methods were demon-
strated in a concised form and compared critically, as far as possible,
with regard to their efficiency and practical application.   (DM 10,--)

W. Bamberger   KFK-PDV 15
Static Optimization of Technical Processes

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Bericht KFK-PDV 15, August 1973
58 Seiten, 12 Abb.

The motivation for this survey was to give an
introduction in the techniques for the solution
of optimization problems in a static behaviour
besides a survey of the quite voluminuous
literature which is not at all complete.

The survey is based on a systematic division of
experimental optimization strategies. In detail
some terms and methodics are explained by means
of some process examples, modifications to these
processes are stated and their essential advantages
or disadvantages are briefly described.

However, the survey does not enter into concrete
applications but describes in general the possibilites
of an experimental static optimization.

The literature mentioned lays no clain to be complete
and is stated till March 1973 as far as known.

                                        (DM 10,--)

D. Hilse: KFK-PDV 16
Interrupt Primitives for Process Control Systems

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Report KFK-PDV 16, November 1973
22 pages, 19 figs.

This report describes on the basis of priority
interrupt systems the definition of standardiz-
able interrupt primitives for process control
systems, and the management of interrupt casca-
des with these tools.   (DM 5,--)

Rudi F.W. Grimm
Comparison of Redundancy Reduction Algorithms with respect to System
Protection Using Process Controllers

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 17, February 1974
33 pages, 57 figs., 7 tab.

The advancing automation of technical systems requires an adequate
automatic system-protection - including the system-control as one part -
by using a process-controller. System-data collection is one main problem
of the system-protection. The data have to be free of redundancy (as much
as possible) because of the limited storage-capacity of the process-controller.
With regard to the given requirements ten redundancy reduction algorithms
have been tested with six signals and have been compared with respect to
the main criteria "compression", "errors", and "computer load". Four predictor-
and interpolator-algorithms show to fit best to the criteria. (DM 10,--)

O. Eggenberger:
Hardware extended executive primitives for process control
systems - Synchronisation primitives (4. intermediate report)

Gesellschaft für Kernforschung m.b.H., Karlsruhe
Report KFK-PDV 18, January 1974
27 pages, 7 figs., 4 refs.

This paper describes executive primitives for the access
synchronisation to shared data and for the synchronisation
caused by events used to coordinate parallel processes.

(DM 5,--)

K. Etschberger, R. Zimmermann:
Human Operator Characteristics and Capabilities in
Performing Process Control Tasks

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 19, January 1974
24 pages, 6 fig., 2o ref.

With the increasing use of computer for process control and
monitoring, human operator tasks become increasingly more
complex especially when responding unforeseen events. There-
fore also in highly automated processes, human operator infor-
mation processing capabilities are of prime importance.

It is the purpose of this paper to analyse human operator
characteristics in performing these tasks in order to
achieve a better integration of man and process. (DM 5,--)

K. Etschberger, R. Zimmermann
Visual Display Systems for Use in Process Control Consoles

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 20, January 1974
43 pages, 12 fig., 3 tabs., 101 refs.

Visual display systems are the most important information
output devices for use in modern process control consoles.

This paper gives a survey of the different kinds of display
systems with reference to numerous reports. Because of their
importance especially CRT displays presently available on
the market are covered and described.   (DM 5,--)

Hans D. Hoelzer, H. Röck, J. Waidelich:
Methods of detecting and locating faults of combinatorial
and sequential circuits

KFK-PDV 21

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 21, March 1974
56 pages, 275 refs.

Following a brief consideration of the advantages of automatic
fault diagnosis in digital systems, this report discusses the
methods of detecting and locating faults on the gate-level, with
particular emphasis on combinatorial and sequential circuits.
This report is based on a number of references given in the
appendix.   (DM 10,--)

R. Moog:
Recognition of symbols on visual displays (Recommendations for
equipment designers)

KFK-PDV 22

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 22, March 1974
21 pages, 26 figs.

This report deals with data concerning human factor's information
related to the design of visual displays especially CRT's. The subjects
covered include legibility of alphanumeric and other elementary
symbols.   (DM 10,--)

W. Becker, et.al.:

KFK-PDV 23

Applications for programmable external modules in computerized
process control systems

Gesellschaft für Kernforschung mbH., Karlsruhe
PDV-report KFK-PDV 23, March 1974

The Efficiency of computer oriented process control systems can be
increased by programmable digital and analogue modules which take over
special tasks from the central processor unit. They make possible the
introduction of dezentralized structures.
Nine different applications are described and discussed in view of

- economy
- accuracy
- speed
- modularity   and
- reliability

(DM 10,--)

Rolf Zimmermann:
Analysis of Requirements for Visual Displays and Associated Controls

KFK-PDV 24

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 24, April 1974
15 pages

This publication contains a questionnaire which can be used both for
specification of user Requirements concerning display and control
capabilities and for analysis of characteristics of existing equipment.

The questionnaire is preceded by a short introduction.

(DM 5,--)

J.F.H. Winkler
A view of the costs of the realization of data structures

KFK-PDV 25

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 25, June 1974
43 pages, 15 figs., 28 refs.

In generating operating systems adaptively the optimal version for a
special application is to be selected out of a set of versions of
operating systems. One feature in which these versions differ is the
realization of the necessary data structures. In order to be able to
compare the different realizations of data structures, the costs which
arise by using the data structures are considered. These are the costs
of the memory for the data and the memory for the routines to manipulate
the data and the costs of the time required to execute these routines.
The present part 1 deals with the realization of elementary data, records,
and arrays.

(DM 5,--)

H. Unbehauen, F. Böttiger

KFK-PDV 26

Control algorithms for implementation on process
control computers

Gesellschaft für Kernforschung m.b.H., Karlsruhe
PDV-report KFK-PDV 26, September 1974
108 pages, 27 fig., 1 tab., 68 refs.

The present paper tries to give a survey about the control schemes
for one-dimensional controlled systems which are especially suitable
for the use with direct digital control. First of all, continuous
controllers are designed, concentrating on the PID-algorithm in its
different forms and modifications. Furthermore, algorithms designed on
the basis of the compensation of the controlled system in discrete
representation, are considered. The best known algorithm of this class
is the deadbeat response algorithm, which can be designed in the
frequency range as well as in the time range. Further classes of
algorithms are those with preset structure, which are optimized according
to a criterion, special controllers for stochastically disturbed systems
as well as nonlinear algorithms.

The mentioned literature represents only a selection of the existing
contributions to this theme.

(DM 10,--)

U. Bäck

KFK-PDV 27

Problems of communication and data acquisition in computer-
controlled production systems

Gesellschaft für Kernforschung m.b.H, Karlsruhe
PDV-report KFK-PDV 27, October 1974
43 pages, 21 figs., 21 refs.

Acquisition of operating data, particularly in computer-controlled
equipment, forms the basis for improvement and monitoring of the
production sequence as well as the basis for control and optimization
of the production process. This report deals with the problems of
on-line data acquisition and with communication between man and
acquisition system. An acquisition plan will be presented in which
the minicomputer, connected to one of the production computers, will
be employed as a central data acquisition point as well as for data
concentration.

(DM 10,--)

F. Verhaag
Machine Tool Control, Computer Linked Numerical Control

Gesellschaft für Kernforschung m.b.H, Karlsruhe
PDV-report KFK-PDV 28, October 1974
82 pages, 38 figs., 6 tab., 20 refs.

An economically attractive control unit has been developed for
NC machines in production technology. By shifting the functions
of conventional NC to the production computer, an NC system of
reduced scope is produced: machine tool control.

The modular layout described here permits adaptability to very
varied tasks, both in the field of production technology and in
other branches of industry. The flexibility of the system is shown
by its facility for monitoring production, by involving AC systems
as well as automatic cutting distribution. The testing and diag-
nostic aids provided by the system contribute to increased
utilization of the whole installation, so that better economy
can also be expected.   (DM 10,--)

M. Gutmann:
Requirements for Control station design

Gesellschaft für Kernforschung m.b.H, Karlsruhe
PDV-report KFK-PDV 29, October 1974

After an approximate classification of various processes according
to levels of automation "low - average - high" the layout of the
manual stations on a central desk and on a secondary panel is
described as a possibility of designing modern control stations
for a plant with a high level automation. The requirements to be
met by control systems in respect of computers are derived from
a comparison between two conventional control stations and two
computerized control stations. These four control stations are
compared with emphasis of the aspect of disturbance.

                                                          (DM 5,--)

F. Freyberger, G. Landvogt, G. Schröder, H.-R. Tränkler

Gesellschaft für Kernforschung m.b.H., Karlsruhe
Report KFK-PDV 30, December 1974
88 pages, 25 figs., 128 refs.

During process control with data processing systems the analog process
variables have to be adapted to the digital computer. Conventional instru-
mentation systems and their components are characterized by the subsequent
adaption of the process control computer. The presented papers show the main
difficulties with the application of traditional instrumentation systems
and alternatively show the essential characteristics of an instrumentation
system with frequency-analog signal representation.

These conspicious characteristics are
   1. signal structure allows simple inexpensive digital conversion,
   2. excellent transfer characteristics give high noise immunity,
   3. high system accuracy for charging purposes (weighing technique),
   4. high reliability by parallel signal channels up to the digital
      bus-line.
                                                          (DM 10,--)

F. Hock, G. Schaffrath:
Linear cost minimisation with process computer

KFK-PDV 31

Gesellschaft für Kernforschung m.b.H., Karlsruhe
Report KFK-PDV 31, January 1975
58 pages, 4 figs., 7 tabs., 2 refs.

The objective of the project was the cost minimisation of processes. By
means of this system the plant engineer has the possibility of steering
the processing-parameters to optimize the costs in course of operation.
Methods of linear programming have been adapted to the requirements of
process computers and process control. This report gives a review of
applications of and experiences with a software package for linear
programming.

(DM 10,--)

P. Karow, G. Rubow, L. Voß, J.Weber
Project of a studio for automatic textile patterning

KFK-PDV 32

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 32, January 1975
158 pages, 58 figs., 3 tabs., 13 refs.

The description of the studio for automatic textile patterning
draftet herewith consists of three volumes.

Volume 1 shows the fundamentals of the studio for automatic textile
patterning and the reasons for setting up such a studio. On this
basis, the concept of a studio for automatic textile patterning is
examined with regard to its usability considering especially economic
aspects. The result is the suggestion to start with the first level
of realisation: Automatic patterning for carpet Jacquard weaving.

Volume 2 deals with the development of the studio for automatic
textile patterning. The first part gives a description of devices,
the second part the description of software concerning the patterning.

Volume 3 finally presents the job scheduling in the studio and the
dialog between operator and computer.

(DM 13,--)

G. Färber
Redundant Serial-Loop-System with standardized Inferfaces

KFK-PDV 33

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 33
68 pages, 6 figs.

The conception, development and construction of a digital transmission
system suitable for the connection of decentralized process periphals
is described. The System has the following characteristics:

- Serial transmission system for the connection of a maximum of 255
  substations each having 255 subaddresses/functions.

- High system reliability through a double system with automatic
  switching of the connection elements; coding procedure allows con-
  nection of substations without breaking of connections.

- High data reliability through CRC-protection-byte and corresponding
  transmission processes (message acknowledgement with message counter).

- Message length $(N + 5)$ bytes, where N gives the number of data
  bytes. Transmission rate maximum 5 Mbit/sec (realized: 500 Kbit/sec).

- Alarm transmission according to geographic priority; additional
  common alarm bit in the header, which shows the central processor
  that there are requests outstanding; overriding of geographic
  priority by global reading.

- Hardware requirement for decoding, parallel/serial conversion,
  automatic switching, CRC generation/checking, hardware procedure
  control: 1 10 x 16 cm card.

- Suitability for adaption to standard interfaces (for example,
  V 24, CAMAC).

(DM 10,--

W.G. Schneeweiß:

Derivation of reliability-parameters of process-control systems

KFK-PDV 34

The main results which are explained in detail in this report are the '
following:

a) An algorithm for an approximate calculation of availability and MTBF
   of redundant repairable systems from relevant data of subsystems To this
   end a computer program can be used.

b) Easy-to-survey formulas for the calculation of availability and MTBF of
   a system with preventive maintenance - where inspection and replacement
   are supposed to be performed very quickly - from the distributions of
   uptime and downtime resp. time between inspections.

c) A method for the evaluation of the probability for the operability of a
   plant during a mission with given pauses and explicite for the case of
   exponential distributions of the periods of usefulness (uptime) and of
   disturbances.

d) Diverse simple formulas for calculating the MTBF of redundant repairable
   systems with statistical dependencies between the states intact and/or
   defective of subsystems and a proof of the fact that statistical depen-
   dencies can result from certain repair strategies.

All these results are important building-blocks of the as yet incomplete
reliability theory of process-control-systems using electronic-computers.

(DM 10,--)

U. Baumann, U.Trilling
Fast formation of test results in the case of slow, stochasti-
cally disturbed measuring systems

KFK-PDV 35

Measurement results are early determined by means of computer
for process control. Algorithms of linear estimation theory and
knowledge of the system dynamic (linear mathematical model) are
assumptions of this prediction.

Results are tested at a pilot weighting machine to reduce
weighting time and at a contact thermometer to accelerate
temperature measurement.

Statements are given upon assumptions, precision to be achieved
and general expenditure.

(DM 13,--)

H.G. Jacob
FORTRAN-Program for the Evaluation of a Local Optimum of a
Bounded Multivariable Function without Determination of its
Derivates

KFK-PDV 36

The FOTRAN-algorithm presented in this report, for the determination
of a local optimum of a multivariable function, shows the following
combination of characteristics:
simple application, small size of the program (ca. 100 FORTRAN-
statements), little requirements in storage (application of process
computers), evaluation of the function derivatives not necessary
(even extrema of discontinuous functions are determinable), possiblity
to consider a variety of boundaries (the initial values of the input
variables however have to be located in a permitted area), low
number of search steps (i.e. function evaluations) for the determination
of the extremum with a given precision (convergence however is not
provable for any imaginable function).   (DM 5,--)

H.Unbehauen,Chr.Schmid,F.Böttiger,B.Bauer,B.Göhring:
KEDDC: A combined process computer program system for the design
and application of DDC algorithms.

KFK-PDV 37

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 37, April 1975
85 pages, 22 figs., 56 refs.

The new program system KEDDC described in this paper represents a
combined process computer program system for the design and appli-
cation of DDC algorithms. This program system allows the on-line
identification of industrial plants, and, based on that, the inter-
active design of optimal controllers and finally the corresponding
process control in DDC-operation. The complex program system is
built up in modular form. It consists of moduls for system identi-
fication and design methods as well as higher DDC algorithms. By its
comprehensive applicability and by the possibility for on-line modi-
fication, the system shows a high degree of flexibility. The program
system can be easily implemented on other process computers because
of its extreme independence from the computer and the corresponding
executive system using FORTRAN IV. The portability of the system per-
mits the implementation of the program moduls in already existing
or new developed program systems for special applications.

(DM 10,--)

R. Zimmermann:
Design of Man-Machine-Communication-Systems
Basic Human Factors, Demands and Recommendations

KFK-PDV 38

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 38, April 1975
31 pages, 2 figs., 5 tab., 32 refs.

This paper shows some fundamentals of man-machine-communication and
deduces demands and recommendations for the design of communication
systems.

The main points are the directives for the design of optic display
systems with details for visual perception and resolution, luminance
and contrast, as well as discernibility and coding of displayed
information. The most important rules ar recommendations for acoustic
information systems, control devices and for design of consoles are
also given.
(DM 5,--)

G. Friesland, H. Ovenhausen:
Testing of Real-Time-Software - Analysis of User Interviews and
Relevant Literature

KFK-PDV 39

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 39, May 1975
46 pages, 9 figs., 142 refs.

The situation in the area of testing real-time-software is unsatisfactory.
During the first phase of the project PROMOTE (prozeßorientiertes Modul-
und Gesamttestsystem) an analysis of the momentary situation took place,
results of which are summarized in the following study about some user
interviews and an analysis of relevant literature.

22 users (industry, software-houses, hardware-manufacturers, and institutes)
have been interviewed. Discussions were held about reliability of real-time
software with special interest to error avoidance, testing, and debugging.

Main aims of the analysis of the literature were elaboration of standard
terms, comparison of existing test methods and -systems, and the definition
of boundaries to related areas.

During the further steps of this project some means and techniques will be
worked out to systematically test real-time software.
(DM 10,--)

J. Ehrig, H. Hahn, H. Hotes, A. Ibarra, E. Skrebutis:

COPF - A Set of Program Building Blocks for Real-Time Operating Systems

Depending on the application, operating systems for process control
computers must often changed, extended or newly developed. To simplify
these tasks a set of functional building blocks for constructing real-time
operating systems was designed. The programs are organized in layers. The
lowest layer consists of hardware-dependent basic functions, the middle
layer of functions that are neither hardware nor application dependent,
and the upper layer of application-specific functions. For the transfer
of an operating system to another computer or the design of a system for
a new application area only part of the building blocks must be reprogrammed.

(DM 10,--)

Development of Sensors for Process Control Systems in the Field
of Production Engineering

Several Institutes of the Hochschulgruppe Fertigungstechnik (HGF)
develop process control systems for metal cutting as a common project.
An account is given of the development of sensors for measuring charac-
teristic values of the production processes turning, milling, drilling,
and grinding. In detail sensors for tool wear, for the approach of tool
to work, for the components of cutting force, and for the surface roughness
are represented. The performance of each sensor is specified.

(DM 10,--)

R. Hoefert, J. Lemmrich:

Compilation, classification, and evaluation of compo-
nents for frequency analog process instrumentation
systems

The components for a frequency analog instrumentation
system have been developed under the PDV project. It is
examined in this report how many of such components are
presently available and can be realized respectively.
The literature and advertizing material were sifted
thoroughly. The components are classified and clearly
shown in tables and diagrams. The results are evaluated
and discussed. A comprehensive list of references is
annexed.

(DM 10,--)

J. Kröger:
Early Recognition of Defects in the Machinery of Ships.

KFK-PDV 43

Service interruptions in the machinery of large and fast ships
have an important influence on the safe and economical operation
of these ships. Conventional alarming equipment monitors defects
mostly when they are critical. An early recognition of defects
would avoid interruptions and make it possible to plan the repair
with respect to the schedule of the ship.

It is reported about a collection of defects, which was necessary
to select areas in the machinery, whose defects have a significant
influence on the ships service and for which an early recognition
is feasible. For three important areas (fuel injection system,
exhaust valve, starting air valve at a diesel engine) this new
supervision, the design of the necessary new measuring devices and
the linkage of these devices to a computer is described.

(DM 10,--)

H.J. Günther, W. Werum, H. Windauer:
Problem Oriented Language for Transport Systems, Language-Report

KFK-PDV 44

A computer independent extensible language is described, which allows
the user himself to program discrete event-driven processes with
problem-oriented formulations. The development of the language took
into account the safety and self-control of the user programs. The
computer-oriented statements (for example alternatives, loops, I/O)
are the same as in PEARL.

(DM 16,--)

O. Hasenfuß. R. Zimmermann:
**Selection of Input Devices and Controls for Modern Process
Control Consoles**

KFK-PDV 45

In modern process control consoles man-machine communication
is realized more and more by computer driven CRT displays, the
most efficient communication system today.

This paper describes the most important input devices and controls
for such control consoles.

A certain number of facts are given, which should be considered
during the selection.

The aptitude of the described devices for special tasks is
discussed and recommendations are given for carrying out a
selection.

(DM 5,--)

All instrumentation for plant process control is centralized in con-
trol stations. The design of the control stations where the operator
supervises the automations, depends on the application and the local
conditions of the process.

The authors present a survey on the physical design of control sta-
tions. This report refers to ergonomical principles and gives a short
glimpse on control technology, the present equipment and display
devices.

The possibilities of process analysis with existing control station
concepts and the use of planning aids for the layout are described
in detail. Hereafter follows an explicit representation of the possi-
bilities of realization showing the trend of development by an example.
The following explanations are the contribution to the guide lines of
control stations.   (DM 10,--)

Characteristics and test setups are defined for the comparison of
direct digital control algorithms for single variable control.
Under the test setup
    - process
    - process controler
    - signal
the control algorithms to be compared are characterized by the
characteristics
    - quality measure
    - sensitivity measure
    - costs.
The defined characteristics under the defined test setups are
investigated for four types of algorithms designed with respect to
    - deadbeat response
    - minimal integrated squared error
    - quantity optimum (PID-structure)
    - quantity optimum with compensation of dead time by the process
      model (PID-structure).
A digital computer program "OPTAL" for design and simulation of direct
digital control is used.
                                                         (DM 10,--)

The intention of this work was the development of a
universal model for adaptive control. The proposed
trendmodel is a statistical description of rapidly
varying processes which are otherwise difficult to
describe. The model uses only signals from a plant
in usual action because test signals are often prohibited
by costs and safety regulations. The algorithms are
formulated in a general way to be used as well for the
identification of a system as for its control. The
conditions of real time action and the capabilities of
process-computers are allowing only for algorithms with
restricted running time and core requirements. The
described trend-algorithms worked well under the conditions
of several real applications.
                                                         (DM 10,--)

J. Nehmer, O. Eggenberger:
Hardware Extended Executive Primitives for Process Control
Systems

KFK-PDV 49

The report summarizes the results of a PDV-project of the same
name. It is divided into three parts, describing a structuring
concept fpr real time operating systems, a set of elementary
operating system functions defined within the frame of the struc-
ture and a related real time software production system.

(DM 10,--)

Report on the PDV-Workshop in Munich on December 1974

KFK-PDV 50

"MIKROPROZESSOREN UND MEHRPROZESSORSYSTEME FÜR DIE
PROZESSLENKUNG"

The following report contains essentials of single papers
presented at the PDV-Workshop on "Microprocessors and Mul-
tiprocessor Networks" held on December 5 and 6, 1974 in
Munich.

The most important features of microprocessors and micro-
computer components - available today - are listed up and
described briefly. Besides typical application schemes are
presented.

(DM 10,--)

KFK-PDV 51

R. Didic:
DC 161 data controller for process automation application

The DC 161 data controller is a programmable unit for process automation
applications. It may be used as a central element to control plant equip-
ment, control centres, communication systems, data concentrators etc.
Modular design permits assembly of cost-effective dedicated system con-
figurations.

Eight program levels, with eight hardware registers each, are provided.
Direct program level switching is achieved by simply applying a switching
request signal - thus providing for a fast reaction to external events.

A particular control interface allows internal central processor sequences
to be controlled by external functional units.

(DM 5,--)

P. Kreis, H. Heikel:
ACCS Adaptable Computer Simulation System

KFK-PDV 52

The study describes a simulation system whose principal area of application is process computer control and related fields.

The major functional components treated are: Generator, simulator, and machine-description language. The first level of the machine-description language is described in special detail.

The guiding idea in the system concept is to let the generator receive the particular characteristics of each machine to be simulated from the machine description, and construct an optimal simulator especially tailored to that machine.

This method also provides an ideal solution environment for optimization problems which arise in technical and scientific work.

This bibliography is intended to be a subjective selection which should allow descriptions and comparisons. An attempt is made to demonstrate some of the problems of simulation by means of a concrete example.   (DM 10,--)

F. Wagner, H. Woda:

"PROCESS BASIC"

KFK-PDV 53

PROCESS BASIC is a programming system for process control and scientific applications by means of a mini-computer. The PROCESS BASIC-language consists of the high-level programming language BASIC, a powerful macro-assembly-language, and the machine code of the used computer. These three language levels can be mixed line by line. Formated input/output statements, and statements for interrupt handling and real-time programming are available. Any processperipherals can be connected to the system easily via a simple software interface. The complete system consists of a one-pass-translator, a loader, a linkage-editor, and a newly developed operating system using 8k (2o bits) of working storage. PROCESS BASIC has been implemented on an UNICOMP 2o1 computer.

(DM 13,--)

R. Isermann, D. Bux, P. Blessing, P. Kneppo

"Control Algorithms for direct digital Control with Process-Computers"

KFK-PDV 54

Methods for the design of parameter optimized, deadbeat and state variable control algorithms are described, which are especially suited for the computer aided design. It is assumed, that a process model in parametric and time-discrete form has been obtained by process identification. Results of simulations give hints for the design, especially for the selection of sampling time and the weighting factor of the process input. Eight selected control algorithms are compared with regard to the resulting control performance, the sensitivity for unexact process models, the computing time between samples, the computing time and the storage for the synthesis with process computers. Finally methods for the design of feed forward control algorithms are described.

(DM 12,--)

P.J. Brunner, H. Bösmann, A. Tarabout, W. Werum

The universal PEARL-operating-system

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 55, January 1976
292 pages, 3 figs.

Based on the semantics of the real-time language PEARL the complex rela-
tionship between individual functions was examined and a program package
was produced containing all the operating system functions necessary for
PEARL.

The program package is written in PL/1 and is available as a basis imple-
menting PEARL, especially on medium scale computers. The interfaces both
to the compiler and to hardware dependent functions, which cannot be part
of a universal operating system, are well defined. The program package is
modularized such that PEARL subsets can also be served.

The following paper provides a description of this package.

(DM 18,--)

SCS Scientific Control Systems GmbH, Hamburg

MULI - MULTI LEVEL DIALOG LANGUAGE - Language and System Description

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Bericht KFK-PDV 56, September 1975, 160 pages, 2 figs.

The structure of a command is defined by the MULI-language as a
command verb and a sequence of specifications. In the MULI-system
there are elementary commands directly associated to function mo-
dules of the application system controlled in dialog, and a variable
number of user-defined and application-oriented compounds made up of
elementary commands by means of a very general and flexible macro-
technique. Furthermore nomenclature of commands and delimiters may
be freely defined by the users themselves so that they have available
language means adapted to their special needs. The command repertoire
may be modified or extended at any time, even on line. The MULI-system
(coded in POLYP) is adaptable to core and performance restrictions by
an automatic generation process, having standardized interfaces to
application function modules and the operating system it is readily
portable with regard to different applications and various hardware
systems currently on the market.

(DM 13,--)

E. Holler, O. Drobnik, R. Knöpker:

Design and modeling of distributed computer systems for process
control applications

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report, KFK-PDV 57, September 1975
99 pages

Criteria for process control applications of distributed com-
puter systems are compiled and basic control concepts of these
systems are developed. Control and structure of distributed
computer systems can be fitted to given realtime requirements
by applying a modeling system which is described in detail.
Modeling experiments are discussed and results obtained shown.

(DM 10,--)

E. Holler, R. Knöpker, O. Drobnik: KFK-PDV 58

A Simulation program for the Modelling of Control Structures for
Computer Networks

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report, KFK-PDV 58, September 1975
67 pages

Computer Networks are an area of advanced technology. For their
design and analysis the engineer should benefit from powerful
design-tools. This report describes a simulation program based
on SIMULA, which we claim to be a powerful instrument for the
modelling of control structures for distributed computer systems.
                                                          (DM 10,--)

R. _____: KFK-PDV 59

a microprogrammed process unit

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 59, October 1975
71 pages 4 figs., 3 tabs., 2 encl.

In this report progress and results of a subsystem develop-
ment in the process data transmission field are described.
This development was induced by the recent progresses in
semiconductor technology, especially with semiconductor
storage elements. The resulting subsystem, designed for
converting, handling, multiplexing and transmitting process
data is controlled by a microprogrammed unit of general
structure. This concept considerably enlarges the capabilities
of the subsystem. Besides the subsystem itself some resources
developed for its usage and some applications are described.
                                                          (DM 10,--

R. Güth   KFK-PDV 60

"Microprogrammable Interface"

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 60, November 1975
34 pages, 35 figs.

The variety of different interfaces in peripheral equipment is a
special problem in planning data processing systems. Different
word length and special conventions of different manufacturers
make it impossible to define a general standardized interface.
Therefore it is reasonable to design a flexible interface, which
can be realized very economically by microprogramming. This report
describes the concept and implementation of a microprogrammable
interface.   (DM 5,--)

R. Moog: KFK-PDV 61

Coding of visual information

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-repoert KFK-PDV 61, December
68 pages 31 figs., 4 tabs.

This report deals with human factors data related to coding
problems of visual displays. The subjects covered include
informations about applicability of information theory to
human information processing, human channel capacity, comparisons
between coding dimensions, deals with further parameters
affecting effectiveness of coding, characteristics of coding
dimensions.
                                                          (DM 10,--)

P.J. Brunner, W. Hinderer, W. Werum

Optimisation methods in systemprogramming

KFK-PDV 62

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 62, January 1976
250 pages, 3 figs., 11 refs.

An optimiser program is introduced, which optimises programs represented
in an intermediate language (IL 1) which is independent of source language
and computer structure. The optimisation techniques are chosen with the
particular objective of reducing the execution time of system programs
written in high level languages by the

     elimination of redundant operations,
     removal of invariant operations from loops and strength reduction
     including linear address incrementation for array elements.

The optimiser program incorporates a global analysis of the possible value of
program topology identifying all program paths and loops.

(DM 17,--)

P. Adamczyk, D. Gerlach:

KFK-PDV 63

Possibilities and Limitations of the Use of Process
Computers in Manufacture

Gesellschaft für Kernforschung mbH, Karlsruhe
KFK-PDV 63, December 1975
218 pages, 38 figs., 30 struc.figs., 141 refs.

This study reviews the possibilities and limitations of the
use of process computers in manufacture, analyzing the infor-
mation flow in manufacture and explaining the software required
for the automation.

Based on 35 European, 40 Japanese, and 42 American manufac-
turing systems the present technical state is represented with
regard to the use of process computers in manufacture, particular
emphasis of the evaluation being laid on the realized functions
of the information flow and on economic aspects.

(DM 16,--)

KFK-PDV 64

W. Hinderer, W. Werum

Methods for testing and generating real-time operating systems

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 64, January 1976
272 pages, 1 fig., 40 refs.

In programming real-time operating systems complex structures
are generally involved which complicate testing considerably.

In this paper methods are illustrated for the automatic com-
puter-supported testing of operating systems. Particular atten-
tion is given to the automatic analysis of programs and to the
dead-lock problem. Furthermore, a very high level language for
real-time operating systems is proposed allowing automatic gene-
ration of program and data structures.

(DM 18,--)

U. Baur

KFK-PDV 65

"On-line-parameter estimation methods for the identification
of linearizable dynamic processes with process computers
- development, comparison, proving -"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 65, January 1976
135 pages, 79 figs., 19 tabs., 52 references

Various recursive parameter estimation methods for the iden-
tification of linearizable dynamic processes are compared first
by digital simulation. Best suited for the on-line identifi-
cation with process computers are the methods of "instrumental
variables" an of "correlation analyses with parameter esti-
mation". Both methods are improved and modified for the appli-
cation in process computers. Methods for search of model order
and time delay and methods for the elimination of low frequent
disturbances (drift) are investigated.
For the practical test of the different methods a FORTRAN
program package called OLID has been developed for the on-
line identification with process computers. Experiments
with a steam heated exchanger show the performance
of the identification methods for the case of very small
signals.

(DM 10,--)

A. Weimann, K. Wanka

KFK-PDV 66

"Computer program GANESI - Description of a computer program
for the simulation of unsteady flows in gas distribution networks"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 66, January 1976
28 pages, 3 figs., 1 table, 11 references

Models for the simulation of the dynamics of gas
distribution networks play an important role for
design and control of these processes.

In this report the computer program GANESI for the
simulation of unsteady flows in gas distribution
networks is described.

Network modelling, applications and handling of the pro-
gram are discussed. The validity and efficiency of the
program are demonstrated by calculated network examples.

(DM 5,--)

A. Giese, H. Ovenhausen, P. Ruts:

KFK-PDV 67

"PROMOTE, Module and Integration Test System for Realtime Software"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Report KFK-PDV 67, February 1976
62 pages, 11 figs., 2 tabs.

For testing realtime-software PROMOTE suggests running
a module and integration test on a host computer and a
system test on the target computer.

The module test system allows systematic testing of a
software system. A set of macros can be used to build
an individual module test environment. The integration
test system performs an interface trace during the
modul integration test.

Some realtime test and debugging aids are designed for
the system test on the target computer.

(DM 10,--)

U. Bäck, A. Schüring

DNC-System

KFK-PDV 68

The first research activities performed at the Laboratorium für Werkzeug-
maschinen und Betriebslehre in the field of machine tools control by pro-
cess computers included the development of methods, programs and process
units, and the public presentation of a pilot system at the 14th Aachen
Colloquium on Machine Tools in 1971. The positive results obtained led
to a continuation of work under a new project which is described in this
report. The results described within this report are concerned with: DNC-
system analysis, methods for computer control system performance evaluation,
operating data acquisition with the corresponding software, real-time process
simulation and production control system.

(DM 13,--)

K.-H. Arnheim, A. Bellmer, O. Böhringer, E. Chazelas,
H. Kregeloh, H. Lengler, A. Mies, A. Ottke:

KFK-PDV 69

"Information and communication system for automatic bus
monitoring and supervising"

A "closed-loop" information and communication system was
developed in the Automatic Bus Monitoring in order to link
the control centre with the running busses. The information
flow is controled by a computer.

Via radio data channel a polling routine defined by the
schedule sequentially interrogates each bus for its present
location, which is transmitted to the computer together with
the automatically provided count data of boarding and aligh-
ting passengers.

The central processor carries out data handling, in a clear
way provides the dispatcher with schedule deviations on a
CRT colour display unit, and stores selected data for later
statistic analysis.

(DM 1o,--)

E. Buxmeyer, G. Haussmann, P. Mielentz, H. Walze

KFK-PDV 7O

Serial Line Sharing System for Industrial Real-Time Applications
(PDV-Bus)

Within the PDV Workshop TP 3o experts from industrial companies
and research institutes designed a process data transmission system
suitable for all industrial applications where large distances have
to be covered, realtime conditions have to be met and high reliabi-
lity is more important than high transmission speed. The Workshop
proposes a bitserial linesharing system with alarm capabilities and
provisions for passive coupling of geografically distributed stations.
Appropriate implementations in PDV-projects shall serve as solid basis
for an improved proposal for standardization.

(DM 5,--)

D. Herbst, J. Kremser

KFK- PDV 71

A Study on the Applicability of the Problemoriented Language PSF
to Plant Transportation Systems

The starting-point of this study was the preparation of the use of
the "Problemspezifische Sprache für Förderprozesse (PSF)" (Problem-
specific Language for Transportation Processes) in the region of
interdepartmental means of transportation. This required the analysis
of means of transportation in the aspect of future computer control.

Due to the variety of types of means of transportation a model con-
struction was necessary to cover entire classes of construction.
The general validity was attained by use of the elementary qualities
as characteristics (e.g. to adhere to the sequence of goods, to single)
of the model elements.

The more detailed description of means of transportation constructions
was dropped and so-called transport elements with fundamental functions
were introduced. As model elements they offer good possibilities of re-
production of the means of transportation.

The analysis described the structures of the transport elements (trans-
port segments and switches) from the view of both static construction
and dynamics of operations.

A separate chapter is dedicated to the drive and its structure elements.
Its description is also made in the view of the transferability into
the PSF-core (DIPOL). The advantages of structured programming can be
utilized by dividing the transport network into subsystems - transport
zones and transport regions. Elements have been defined which clearly
fix the limits of the subsystems.

The interfaces towards the environment are covered by materialflow
sources (feeding points) and negative sources (targets). It was de-
termined which model elements can carry out these functions.

The geometry of a transportation system can be described by structured
distance data or coordinates. These model elements have been summarized
in one chapter.

The defined terms of mechanical handling form the basis for a formal,
problemoriented language as endeavours were made to derive the defi-
nitions from the primary terms such as marked point, goods data, ve-
hicle, conveying track, direction and drive. This leads to structured
model elements which can be transformed into the formal language by
means of the structure attributes existing in DIPOL. This result of
the study was testified in the appendix by a practical example which
demonstrates the process of transformation.

An important side effect of this study is the contribution to the de-
termination of mechanical handling terms which so far rarely had an
unambiguously defined meaning.

(DM 10,--)

T. Derenbach, R. Kleesang, E. Verhaag:

KFK-PDV 72

"Contouring Control System, Design and Development of an optimal
lay out, partially computer-integrated Contouring Control System
for Machine Tools"

In this project partial and total computerized solutions of the
interpolation problem have been examined. In the first case tasks
were shared between the computer and a hardwired linear interpolator.
In the total computer implementation the hardware interpolator is
replaced by a software program, which can realize linear and
circular interpolation.

A method for implementing position control in the computer is
described in a further chapter.

(DM 10,--)

S. Köhle

"Automatic control and optimization of the electric steelmaking process"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 73, June 1976
47 pages, 15 figures, 3 tables, 31 references

The report outlines the techniques which have been developed within a project for automation of electric steelmaking plant and which have been tested practically using a process computer.

The minimum cost charging materials and alloying additions, respectively, are determined by means of the charge and alloy calculation. Energy distribution control monitors the energy consumption and apportions the disposable energy for melting to the different furnaces according to their priorities at the time. The furnace control traces and records the charging run-off and controls the electric melting power. The averages of the electric arc values are calculated from measured figures.

(DM 5,--)

R. Stimmelmayr, D. Henning

Fault Diagnosis of Process Automation Systems with Check-out Computer and Fault Reference Listings

Gesellschaft für Kernforschung mbH, Karlsruhe
KFK-PDV 74, April 1976
34 pages, 1o figs., 4 encls., 4 refs.

Different methods of fault diagnosis for process automation systems are shown. Then a practical example of fault diagnosis with fault reference listings is discussed and the listings evaluated. A description is also given of the hardware and software used for this fault diagnosis.

(DM 10,--)

"Specification CIMIC/1"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDVreport KFK-PDV 75, May 1976
44 pages

CIMIC/1 (Compiler Internal Machine Independent Code) is a symbolic computer independent intermediate language of assembler level, designed to represent programs, written in ASME-PEARL-Subset/1. It was developed to implement portable compilers. In a first step a PEARL program is translated by the ASME-Stufe 1 - Compiler into CIMIC/1 and in a second step this CIMIC program is translated by a code generator into the assembly language of the relevant target computer.

In this report the intermediate language CIMIC/1 is specified.

(DM 5,--)

ASME-PEARL-SUBSET/1   KFK-PDV 76

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report 76, May 1976
90 pages, 9 references

The present report describes a PEARL subset that was used
within the ASME Working Group as a basis for implementation
on different target computers. The design of this subset was
influenced by various limiting conditions. On the one hand,
the user was to be afforded a high degree of programming ease
by the widest possible selection of PEARL language features
while, on the other, the subset was to be easy to implement.
In view of the contrasting requirements for the subset design
emphasis was placed for selection on the PEARL language
features relevant to real time programming, i.e. the task
concept and process I/O (including graphical I/O). Deletions
from the full PEARL definition were made principally in the
algorithmithic section and to a limited extent in the
standard I/O. In each case the system section was defined
for a specific facility.   (DM 10,--)

R. Guse, J.C. Promoli, O. Schreiber, G. Schuon   KFK-PDV 77

Automatic control of a ring Spinning machine

Gesellschaft für Kernforschung mbH, Karlsruhe

Report KFK-PDV 77, June 1976
65 pages, 24 figs., 1 table, 12 refs.

The aim of this work was to develop a system for the automatic
recognition of thread breaks on the ring spinning frame. A
method had to be derived from the statistical behaviour of the
thread breaks to control the speed of the spinning frame, so
that during the spinning process a constant, as an optimum known
rate of thread breaks appears. Because of the extremely high
number of spindles on a spinning frame, the development of a very
inexpensive method of thread break detection and data reduction
had to be found. Solving this problem is possible by means of
cheap electronic thread break detectors, which form a ring counter
connected with a spinning frame monitor. In the monitor thread
breaks are registered as they occur and transmitted to a computer
on request. The computer evaluates the necessary correction of
the spinning speed from the difference between the nominal and
actual number of thread breaks. In addition to thread breaks
places in the yarn are registered with optical pick-ups at selected
spindles and classified in the monitor. From these data the dis-
tribution of thick places is calculated by the computer. This
information can be used to adjust the yarn cleaners in the winding
process following the spinning process.   (DM 10,--)

Fr. Wick, G. Kögel   KFK-PDV 78
"Module System of Data Terminal"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 78, June 1976
47 pages, 7 Fig., 21 ref.

In this report requirements of a modular system of data terminals
for data acquisition and telecommunication are described, and the
PAT data terminal system which has been developed under the PDV
project is represented.

This module system consists, on the one hand, of simple and price-
worthy data processing terminal equipment which can be installed
in large quantities in data networks and, on the other hand, of
partly autonomic terminal with micro computers for use as data
concentrators and intelligent operating data acquisition units.

                                                        (DM 5,--)

E. Franz, W. Fröhlich, R. Hörmann, N. Henkel, R. Butzer

"System Application in Running a Melting Tank"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 79, June 1976
89 pages, 27 figs., 7 references

On the melting tank has been installed a data logger which makes
unnecessary the traditional daily recordings. From the data analyses
has been elaborated a uniform operating technique for the melting
tank tested as well as for other tanks.
A regenerator model could not be applied in practical operation
because calibration measurements were impracticable with the
given installation.
The digital analytical mathematical models of the melting tank have
shown interesting individual perspectives, without having been matured
though to an extent making it possible to use them in practical applica-
tions.
The cell model as a substantial mathematical model cannot be used
on the melting tank for mathematical reasons.
It is safe to assume that, within the next 10 years, there will be no
mathematical model of the melting process allowing for on-line
control of the same.

(DM 10,--)

U. Gogrewe, A. Schüring, E. Westkämper:

"Processcomputer material flow control for interlinked,
numerically controlled production facilities"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 80, June 1976
99 pages, 50 figs., 5 table, 49 references

The flow of material between interlinked production facilities is
of great importance. It is reasonable to control the appropriate
transport processes using a process computer. This report deals
with the organisational and operational software for the three
principal types of flexible manufacturing systems. The results are
explained with the help of examples.

Maximum utilisation of the production machines as well as minimum
number of paletts and minimum set-up time are the aims of the system
organisation. Two models are developed for operational system control:
A central process computer control and as an alternative, hierarchially
decentralised control with mainly distributed intelligence.

(DM 10,--)

P. Ernst, V. Hartmann:

"Process Control System for Drilling"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 81, August 1976
55 pages, 28 figs., 6 refs.

At the 'Institut für Mechanische Technologie und Werkzeug-
maschinen' a process control system for drilling has been
developed. The most important components of the system are
a machine for Adaptive Control, sensors for the approach of
tool to work, sensors for the components of cutting force
and over that an analysis of cutting operation and a method
of Adaptive Control. The components are described in follo-
wing report and their performances are specified.

(DM 10,--)

F. Leonards, W. Müller, F. Otto, H. Sinning: KFK-PDV 82

Control systems for the turning process

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 82, August 1976
153 pages, 92 figs., 6 tab., 57 refs.

In co-operation with several institutes of the HGF (Hochschul-
gruppe Fertigungstechnik) computer based control systems for
the turning process were developed.

This report deals with strategies, characteristics and sensors
for adaptive control systems. The report begins with a survey
on Adaptive-Control-Constraint-Systems (ACC) and continues
with a detailed description of the realized process-control-
systems:

1. Adaptive-Control-Constraint-System (ACC) with
   automatic Determination of tool pathes.
2. Adaptive Control Optimization (ACO)-System in DNC-
   mode.
3. Combined ACC-ACO-System.   (DM 13,--)

Several authors   KFK-PDV 83

"ACO-controls for milling machines".

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 83, September 1976
175 pages, 66 figs., 42 tabs.

As a common project of several institutes an ACO-pilot-plant for
milling has been developed. Components of the system are as follows:

Approach and toolwear sensors, DDC-system for the control of torque
and power, programs for avoiding chatter, cut distributions, off-
and on-line optimization.

The lay-out and the functioning of the individual components as well
as the whole plant are described.

                                                    (DM 18,--)

H. Mushardt, E. Scherf, R. Kleensang, R. Bierlich: KFK-PDV 84

Process Control Systems for Grinding

Gesellschaft für Kernforschung mbH, Karlsruhe
KFK-PDV-report 84, September 1976
93 pages, 53 figs., 40 refs.

A report is given of two adaptive control optimization systems
for cylindrical plunge grinding. Developed both for rough
grinding and finish grinding, the optimization is ground on
the mathematic description of the grinding process. Sensors
for the cutting force, the wheel wear, the diameter of the
workpiece and the surface roughness are watching the process
and a computer calculates optimal parameters for grinding and
controls the machine. Construction and function of the model
systems are described detailed.

                                                    (DM 10,--)

D. Stams

"The market of process control techniques - its present and future
structure, aspects related to a funding policy"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 85, July 1976
75 pages, 13 figures

The paper presents the economical importance of testing-, control-
and automation-techniques and the importance of the innovation of
these techniques by means of computer based information processing.
The effect of the innovation upon the structure of the markets is
investigated and the thereby related changes of the market-situation
are described. From these considerations aspects of innovation-spon-
soring are deducted.

(DM 10,--)

G. Spur, W. Adam, H.P. Mattle, A. Pätzold, W. Prehn,
H. Rittinghausen, G. Seliger, W. Wentz, F. Zastrow

"Basics on Process Automation for Manufacturing"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 86, August 1976
219 pages, 97 fig., 9 Tables, 91 references

In spute of different highly automated components already existing
the level of automation for small and medium batch production is low
compared with that of mass production. Therefore at the Institute for
Machine Tools and Manufacturing Technology of the Technical University
of Berlin a system for direct numerical control of discrete NC machine
tools (DNC-System) was developed. An extensive automation of communi-
cations was achieved by the enlarged DNC-functions of processdata
collection and guidance. The project was completed by realizing the
first step of a flexible manufacturing system for rotational parts.
The efficiency of material flow systems is adapted to that of the
highly automated workstations and communications by the automation
of transport and handling functions. Means of control, handling,
chaining and subsystems, integration shall be tested within this
model installation.

(DM 18,--)

H. Burkhardt, H. Altmann, R. Lunderstädt:

Realization of Optimal Control Problems - Application and Implementation
of Modern Control Methods to the Optimal Guidance of Processes

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 87, September 1976
79 pages, 27 figs., 55 references

The application of optimal control theory to realistic problems leads
to closed analytical solutions only in a few cases which in addition
are mostly of no practical relevance. Therefore, when realizing optimal
control special attention must be paid to suboptimal and numerical
solutions. This report investigates some methods to solve and realize
optimal problems with partly quite different processes and various cost
functionals. The main research was concentrated to digital oriented
solutions and realizations which are well suited for an implementation
on a process computer.

(DM 10,--)

L. Willner, W. Rademacher, W. Drexler

Application and configuration of hybrid
process control systems

Mathematical models for the cold-rolling process

KFK-PDV 88

This report (KFK-PDV 88) presents a mathematical description
of the cold-rolling process. For this purpose, the cold-rolling
process in a single mill stand is divided into sub-processes.

The corresponding mathematical models are arranged in 6 groups,
namely

1. Model of roll force and torque

2. Models of the entrance- and exit velocities
   and of the interstand tension

3. Model of the work roll deformation (profile) and
   roll gap change in a 4-high stand

4. Dynamic models of the elastical stand deformation,
   the screw actuator and the roll bending system.

5. Approximation of the strip interstand transport delay

6. Model of the electrical mill motors

These six model-groups suffice not only to describe the cold-
rolling process in a single-stand mill but also in a multi-stand
mill.

In report KFK-PDV 89 these model-groups form the basis to
derive a linearized mathematical model of a multi-stand cold-
rolling mill, for which a control system is designed and tested
by hybrid computer simulation.

(DM 10,--)

L. Willner, W. Drexler, W. Rademacher, P. Varhegyi

Application and configuration of hybrid process control
systems / 2

Control and simulation of cold-rolling tandem mill

KIFK-PDV 89

Based on the model-groups for a single rolling stand, as
presented in report KFK-PDV 88, a linearized process model
for a 6-stand cold-rolling tandem mill is derived. A hierarchical
control system is designed for the obtained model and tested by
simulation.

The control system is composed by a digital and an analog
controller; the choise of controller type is determined by the
speed of the digital components. The digital controller,
realized by a process computer, is calculating the nominal set
points for the multi-stand mill and is correcting longtime
deviations. The analog controller is needed for controlling
fast changes and disturbances in the stands.

The synthesis of the analog controller is performed in two
steps. First for each stand an optimal control is calculated
which yields, together with a control to counteract interstand
interactions, a suboptimal control for the multi-stand mill.
This theoretically two-level control scheme is then converted
to a suboptimal controller with feedback of output variables
only.

The results are tested by hybrid computer simulation of the
mill model without and with control.

(DM 10,--)

H. J. Gebert, H. Wilhelm, H. Zimmermann

"Modelling and simulation of power plant processes"

KFIK-PDV 90

The first part of the paper deals with the basic aspects of
modelling and simulation relating to power plant application,
whereby the main emphasis is given to the systematic approach
for obtaining an economical modelling.

In the second part the results are given obtained with three
different types of power plants:

- DDC-controlled coal-fired steam generator
- combined cycle unit power plant with combustion air
  supply by gas turbine and forced-air fan
- pressurized-water reactor power plant with straigth-
  tube-once through steam generator

It ist evident that all existing dynamic problems can be
solved with the presented modelling and simulation methods.
Proposals for an extended economical modelling and optimum
application of simulation are made.

(DM 10,--)

M. Clauß, G. Meier, N. Vukas: KFK-PDV 91

Line Sharing System for Computeroriented Transmission of Process Data

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 91, March 1977
48 pages, 17 figs.

A large number of lines are required in the instrumentation of tech-
nological processes between measuring equipment and actuators in the
process area and the processing units, display units and operator
consoles in the central control room. The development of a process bus
is described here which connects up to 1000 participants replacing
point-to-point wiring. The functions of data logging, continous
control and sequence control are performed by a mini-computer which
acts at the same time as bus driver. Computer and process bus can be
built up as double system if required by reliability aspects.

                                                            (DM 10,--)

M. Burmeister, P. Günther, R. Güth, J. Hunger, W. Straßer,
H.-J. Teichmann   KFIK-PDV 92

"Fundamentals for use of displays in process control"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 92, November 1976
220 pages, 77 figs., 3 tabs., 88 references

This report describes the technical feasibilities of video displays,
the necessary controls, display processors, storage devices, and
interfaces for the use in process control. Examples for hardware
realizations are given. Software problems like portability and
appropriate data structures are considered theoretically.

                                                            (DM 18,--)

L. Felkel, R. Grumbach   KFK-PDV 93

"ALSAN - A System for Disturbance Analysis by Process Computers"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 93, May 1977
38 pages, 11 figs., 17 references

The program system ALSAN has been developed to process the large
number of signals due to a disturbance in a complex technical
process, to recognize the important (in order to settle the distur-
bance within a minimum amount of time) information, and to display
it to the operators. By means of the results, clear decisions can
be made on what counteractions have to be taken. The system works
in on-line-open-loop mode, and analyses disturbances autonomously
as well as in dialog with the operators.   (DM 5,--)

R. Buck, W. Ruppel, M. Zeitz   KFK-PDV 94
_____

"Dynamical models and simulation of chemical processes"

Part I Catalytic fixed-bed reactors

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 94, October 1976
152 pages, 53 fig., 9 tables, 41 references

A general dynamical model of catalytic fixed-bed reactors
is derived which considers the dispersion of mass and energy,
the effectiveness factor as well as the catalyst decay. The
simulation of the highly nonlinear two point boundary value
problems is performed using hybrid and digital methods de-
veloped for this purpose. A comparison of the simulation
results and the experimental measurements based on a pilot
reactor of Farbwerke Hoechst AG enables the verification of
the mathematical model. The verified system equations form the
basis for the design of control algorithms. Experience with
the control of a pilot heat conduction system by means of a
process computer is already available.

(Part II Distillation columns KFK-PDV 95)   (DM 10,--)

F. Silberberger   KFK-PDV 95

Dynamical models and simulation of chemical processes

Part II Distillation column

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 95, April 1977
125 pages, 52 fig., 26 references

First a general model of a multicomponent distillation column (plate
column) is shown. For both phases (vapour and liquid) the material
and energy balance equations are considered, the mass transfer is
described by mass transfer coefficients.

Then, in order to describe industrial plants, a simplified model is
developed, which consists only of the material balance and which
considers the energy balance only in an extremely simplified way.

With this simplified model a column for cleaning waste water from the
Hoechst Aktiengesellschaft with an extremely nonlinear temperature-
profile is simulated and compared with experimental results of the
plant. All essential effects of the column are well described.

The most important data about the used computers and about calcula-
tion-times are summarized in a small appendix.   (DM 12,--)

P. Kneppo   KFK-PDV 96

"Comparison of linear control algorithms for process computers"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 96, October 1976
151 pages, 63 figs., 20 tabs., 37 references

The application of process computers in process control makes it
possible to synthesize control algorithms by on line identification
of the process (to be controlled) by the process computer itself.

This report describes the synthesis and test of parameter- and
structure optimized discrete control algorithms for processes whose
models have been obtained by on line identification.

The first step of investigation was the simulation of two test-
processes with one input and one output on a CDC 6600 computer. The
characteristics of the control loop - control performance, sensitivity,
and the computing time for the synthesis between two samples where
reported.

In the second step the practical test of the simulation results was
performed on a steam heated exchanger controlled by a HP 2100 A
computer.
The control on a steam heated exchanger with state controller and
observer under different measuring- and sampling times will be shown.

All programs have been written in FORTRAN resp. process-FORTRAN.
                                              (DM 13,--)

E. Bendeich, J. Kölle

"Aids to the user of process control computers in discrete
 manufacturing processes"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 97, October 1976
255 pages, 81 fig., 20 tables, 77 references

The following report is a description of aids to support
potential users of process control computers in planning and
initiating such systems, especially in the field of part-flow-
processes like warehousing, transportation, production and
testing.

The main parts of the report are the process analysis,
system design and selection of a specific computer system
for the user's requirements.

All activities of the user starting from the planning to the
introduction of the system are described with net-flow-plans
and decision-flows.

Furthermore, the present situation of the process control
computer application for part-flow-processes is described.

(DM 18,--)

A. Weimann (editor):

"Simulation and Control of Gas Distribution Networks",
Representation of the Program System GANESI

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Report KFK-PDV 98, December 1976
138 pages, 53 figs., 1 tab., 14 refs.

- Control of gas distribution networks from the
  view point of operator
- Control of gas distribution networks from the
  view point of the software producer
- Remarks on the simulation of unsteady flow in
  gas distribution networks
- The computer program GANESI for the simulation
  of transient flow in gas distribution networks
- Some aspects of the presentation of the program
  GANESI on a process computer   (DM 13,--)

K. Eibl, A. Weimann

"Experimental Validation of the Computer Program GANESI"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 99, April 1977
182 pages, 38 figs., 5 tabs., 6 references

The computer program GANESI was designed for the simulation of
transient flow in large gas distribution networks with loops. With
measurement data from highly transient flow

    - in a transport pipeline for raffinery gas
    - and in a large natural gas distribution network

the accuracy of simulations of transient flow with the grogram GANESI
was proofed. It could be shown that in both cases computed pressures
matched the measured pressures within the accuracy of the measurement
data.

The validation of the computer program GANESI could be completed with
excellent results.

(DM 15,--)

Programmers Handbook for ASME-PEARL-SUBSET/1   KFK-PDV 100

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 1oo, November 1976
181 pages, 2 figs.

A middle-level programming language is described which allows
the formulation of the structure, the algorithms, time behaviour
and I/O of realtime programs.

Besides the usual programming aids such as blockstructure, loop-
control etc. the language offers the user the important feature
of the "Task", which gives the ability to program processes that
are parallel in time.

There is a series of statements which give the time-correlation
of those tasks, the so called "Tasking". Moreover the structure
of connections of standard-I/O-devices and process-control-devices
is described by the language, so that all information for the pro-
cess-control is located in the program.

The language is destined for the   process control engineer or
experimentor with some programming experience. This report des-
cribes the syntax and semantics of the various PEARL-statements
and gives examples of them.

                                                    (DM 15,--)

Report on the PDV-meeting in November 1976
in Karlsruhe   KFK-PDV 101

"Use of Micro-Processors for Process Control"

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report KFK-PDV 1o1, January 1977
45O pages, 176 figures, 2o tables, 121 references

The contributions included in this report represent the
essential contents of the corresponding lectures given
at the PDV-meeting "Use of Micro-Processors for Process
Control" in Karlsruhe on November 3 and 4, 1976. Besides,
this report contains lectures which were not presented
personally. On the first day the lectures were dedicated
to the systemstechnology, on the second day typical examples
of application were presented.

                                                    (DM 35,--)

S. Köhle, R. Lichterbeck, P. Schmidt   KFK-PDV 102

Energy distribution control in electric steel plant

Gesellschaft für Kernforschung mbH, Karlsruhe
KFK-PDV 1O2, December 1976
48 pages, 15 fig., 10 refs.

There is a method described for monitoring and controlling the
energy consumption in electric steel plant which has been
realized in a plant including four electric arc furnaces with
using a process computer. The energy available to the furnaces
within a control interval of e. g. 15 minutes after deduction
of the power requirements of non-disconnectible consumers is
allocated among the different furnaces by adjusting their
voltage and by disconnection according to actual priorities.
The energy distribution control allows for both lowering of
energy costs and reducing of production flow obstructions
produced by energy limitations during maximum load periods.

                                                    (DM 1O,--)

W. Hofmeister, A. Kantner: KFK-PDV 103

Mathematical models of power station units with once-through
steam generators

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-report, KFK-PDV 103, January 1977
64 pages, 14 figures, 30 references

The application of process computers for the automation of power
station units enables the economic realization of sophisticated
control structures and algorithms. The synthesis of such powerful
control systems cannot be carried out on the basis of a vague
knowledge of the process. Neither can the control parameters be
optimized on the process itself. The design of such highly sophis-
ticated control systems requires theoretical studies and simulations
by means of accurate mathematical models of the process.

Although models of power station units have been in use for years,
the methods for developing models are still being improved. In
particular nonlinear modelling is at an early stage at present.

This report describes the state of the art of linear and nonlinear
modelling of the power station process. The models can be applied
to conventional and nuclear steam generators. The dynamic response
of the linear model has been compared with responses obtained by
field tests. The accuracy of the model proved to be satisfactory.

(DM 10,--)

G. Kochen, R.J. Kelm, L. Mayer   KFK-PDV 104

Digital electro-pneumatic positioner

Gesellschaft für Kernforschung mbH, Karlsruhe
Report KFK-PDV 104, December 1976
24 pages, 13 fig., 26 refs.

Within the scope of this project a digital electro-pneumatic
positioner for a digital input signal for attachment to dia-
phragm actuators for control of valve position has been con-
ceived, developed and designed.

The laboratory sample is consisting in the modules:

    digital position signalizer
    digital comparator
    digital controller
    module for control by solenoid valve battery

Satisfactory results have been achieved with respect to
static and dynamic behaviour. They are in good conformity
with theoretical and practical preliminary research taken
by means of a simulation model.
The principle used allows positioning control by local
controller as well as by central computer.
                                                    (DM 5,--)

N. Korn, W. Ziegler:

Transmitters for mechanical Magnitudes

KFK-PDV 105

Within the scope of this project pressure measuring devices
with digital output signal have been conceived, developed
and designed which seem to render it possible to produce
on an econimic base within a reasonable time reliable
measuring transmitters on this principle meeting the ex-
treme demands implied by the range of application. To solve
these problems the following activities have been executed:

1. Fundamental researches in principal methods
2. Comparison and evaluation of these methods with respect
   to efficiency and ability of realization
3. Performing and examination of two test assemblies
4. Evaluation of utility of both test assemblies

Under consideration of the marginal conditions to use the
measuring transmitters in digital control systems and in
the chemical process control the following structures
have been examined:

- measuring transmitters with conventional pressure sens-
  ing systems and AD-transducers
- pressure transmitters with a frequency output signal
  depending on the measured magnitude
- measuring transducers with direct AD-conversion with-
  out electrical intermediate signal

A comparison of the results of examination proves that
a measuring transmitter which meets all demands stipulated
can at present be realized best with conventional
pressure sensing system and AD-converter.   (DM 10,--)

E. Dittmar, H.-J. Kiersch, U. Schmudlach, J. Weihrauch:

New Concepts of Control Centre Design and Development

KFK-PDV 106

This report shows the concept of modern control centre technology
and describes its realization at project including the supervision
of an electric power distribution system.

A modern control centre is characterized by the fact that conven-
tional control elements are more and more replaced by elements of
computer technology, i.e. computers and displays. The different
functions implemented by hard- and software set new standards re-
lative to flexibility, adaptability, dimensioning. The communica-
tion interface man/process is defined and designed in a new way
allowing a dynamic and more efficent supervisionstrategy of tech-
nical processes via display in different operation modes.

Special attention ist paid to adjustments and extensions of process
elements and their integration into the supervised network.
                                                      (DM 12,--)

G. Stute, A. Storr, D. Binder, W. Döttling, H. Fink, J. Firnau, A. Herrscher, H. Wörn:

Basic Considerations in the Automation of Manufacturing Process Controls (for Flexible Manufacturing Systems)

The application of realtime computers in the area of manufacture for the control of individual NC machines was, up to now, limited mainly to the storage and distribution of control data in so-called DNC (Direct Numerical Control) Systems. An extension of the DNC systems aims at improved economic benefit by the inclusion of additional functions from elsewhere as well as functions not automated up to now. Here control functions which occur frequently in the machine sphere are transfered to the central processing computer. Functions which have not been automated up to now are, for instance, those concerned with workflow organization and production data acquisition. In Flexible Manufacturing Systems these functions have to be automated. A control system for a Flexible Manufacturing System has been developed and built at the Institut für Steuerungstechnik der Werkzeugmaschinen und Fertigungseinrichtungen at Stuttgart University. It has a hierarchical structure and groups the recurring functions together in units. The application of the results should not be limited to Flexible Manufacturing Systems. Basic considerations and results of the development are described.

(DM 12,--)

S. Köhle:

Bases of the high-current system of arc furnaces

The relations between the inductances of the loops are studied, which are formed by the three high-current lines and a measuring line connected to the vessel. It is shown how the inductance values measured in single-phase short circuit shall be corrected so that they become compatible. An equivalent circuit diagram proposed in the literature and the known methods for measuring instantaneous values of the electric arc variables are described. Two other methods are indicated allowing to calculate approximately the mean values of the arc variables assuming linear conditions.

(DM 10,--)

Proceedings of a Symposium about PEARL in Augsburg, March 1977

KFK-PDV 110

Both, the PDV Project Management of Gesellschaft für Kernforschung mbH, Karlsruhe,
and the VDI/VDE-Gesellschaft Meß- und Regelungstechnik, are organizing on March 9,
1977, a public symposium about PEARL, the unified realtime programming language in
the Federal Republic of Germany. This report contains papers of speeches given at
the symposium about the following topics:

- The sponsoring of PEARL within the Project PDV (history, status, future,
  standardization),
- PEARL as compared with other realtime languages,
- Experiences with present PEARL subsets (both in laboratory and industrial
  environment).

(DM 10,--)

H. Birck, H.G. Jacob, G. Schmidt:

KFK-PDV 111

Digital control of domestic oil burners reduces air pollution

After a brief description of the working of oil heating plants for
domestic use, experimentally obtained families of curves showing the
performance of the heating plant, with respect to pollution as well
as consumption of oil, are explained. A corresponding quality
criterion is derived. The simulation investigations are based on
mathematical models of a standard domestic oil heating installation
and of the time sequences of the typical perturbations acting on the
plant.

Simulation runs on heating installations without control process
equipment are compared with simulation runs using programs for
extremum seeking control, automatic starting commands, and self
surveillance devices. The results demonstrate the effectiveness of
such concepts particulary with respect to pollution suppression. The
results of on line extremum seeking control by a microcomputer con-
troller coincide with the previous simulation runs. It is shown, that
digital control of domestic oil burners by microcomputers is tech-
nically and economically feasible.

(DM 10,--)

H.-D. Bauermann:

KFK-PDV 112

Simulation and mathematical modeling of pulsated counter-current
extractors

For a pulsed sieve-plate-extraction column, operating in the tech-
nical interesting dispersion region, a mathematical model was built
to simulate the dynamic behaviour by changing inputs (concentration-
and flow rate disturbances in raffinate and extract, pulsating
disturbances).

The parameters of the model (e.g. backmixing, holdup, efficiency) were
estimated from correlations to consider the mutual dependance. It is
demonstrated that the extraction column can be approximated by a
system of second order with two equal time-constants and the dead-
time, whereby the characteristic time values can be correlated with
the changing input parameters. The reduced model is the base for a
feed forward control with a microprocessor, as well as for a sim-
plified analysis of the dynamic behaviour.

(DM 15,--)

Budde, W.; Ernst, G.; Imbusch, K.:

KFK-PDV 114

Simulation of a Manufacturing System Shown With the Example
of Graphic Verification of Control Data for NC Machine Tools

The present research report describes a program system that
simulates graphically the process of operations on numeri-
cally controlled machine tools with the aid of control data,
the latter being alternatively the output of APT-like NC-
processors as well as manually prepared control programs.
The formal, logical and graphical verification of the control
data enables to reduce direct and indirect production costs
and brings about a rationalization effect in manufacture.

(in preparation)

KFK-PDV 120

Basic PEARL Language Description

Gesellschaft für Kernforschung mbH, Karlsruhe
PDV-Report KFK-PDV 120, 1977

This document is the official common language description of Basic
PEARL. Basic PEARL is the subset of Full PEARL which was defined as
the minimum that each PEARL implementation must contain. At the time
being, it has been accepted and included in their implementations by
the following firms: AEG, BBC, Dietz, GPP, Krupp-Atlas, MBP, and
Siemens.

(For Full PEARL, refer to Language Description KFK-PDV 130, Gesell-
schaft für Kernforschung mbH, Karlsruhe.)

(DM 30,--)